



Predicted timing and location of seismic activity on Enceladus



Ice shelves in Antarctica are the closest terrestrial analog to the shells of icy-ocean worlds, as they are locations where coherent ice sits atop an ocean and responds to tidal forcing. We investigated the relationship between tidal stresses and observed icequake activity along a pair of icy fractures within Antarctica's Ross Ice Shelf that have similar lengths and widths to the "Tiger Stripe" fractures on Enceladus (see figure on left).

We identified relationships between seismic activity, tensile stress, and stretching rate at the Antarctic fractures and found that the majority of icequakes occur during falling tide, when the rifts are being stretched open.

Using modeled stress values along the Tiger Stripe fractures throughout Enceladus' orbit and the data from our Antarctic observations, we were able to predict where and when icequakes should occur along the Tiger Stripe fractures (see figure on right).

Our results show that the majority of icequakes along the Tiger Stripe fractures occur around 100° past pericenter (closest distance to Saturn) in Enceladus' elliptical orbit and that these icequakes are very small, but numerous.

These predictions are valuable to future landed missions to Enceladus or other icy-ocean worlds, where icequakes will help us understand what lies beneath the ice.

